



## **CXM Top Level Requirements**

- **Process:**

- **Framework for specifying requirements in place**
- **Top level requirements flowed into all telescopes and subsystems.**

- **Last 6 months**

- **Outlined a complete(?) set of 24 rqmts**
- **Effort has focused on timing, effective area requirements**



## **CXM Top Level Requirements**

- **Next 6 months:**
  - **The Requirements Document is online, and comments are requested by FST, IPTs**
  - **Team efforts will focus on calibration requirements & flowdown**
  
- **Requirements/Calibration Splinter**
  - **Tuesday, Bldg 21, Room 183A, 2:30 – 500pm**



## Requirements Summary

### 1. Band Pass

- 0.25 keV to 40 keV (<0.20 to >60 keV)

### 2. Resolution

Band	Resolution	Goal
0.25 to 10.0	300	600
6 – 8.5 (TBR)	3000	TBD
8.5 to 10	3000	TBD
10 – 40	10	TBD

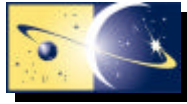


### 3. Spectral Accuracy

<20% (TBR) of the energy (wavelength) resolution,  
with a goal of <10% (TBR)

### 4. Effective Areas:

<i>0.25 to 10 keV</i>	<i>1,000 cm<sup>2</sup></i>
<i>10 to 40</i>	<i>1,500</i>
<b>0.25 keV</b>	<b>TBD</b>
<b>1 keV</b>	<b>15,000</b>
<b>6.4 keV</b>	<b>6,000</b>
<b>40 keV</b>	<b>1,500</b>



## 5. Photometric Accuracy

**Absolute:**

**<10% on-axis with a goal of 5%.**

**Relative:**

**<5% (TBR) between 0.25 and 10 keV**

**<20% (TBR) between 10 and 40 keV**

**Off-axis response: Additional errors < 1% (TBR)**



## 6. Optics Angular Resolution

£15 arc-sec HPD 0.25 keV to 10 keV (<5 arc-sec goal)

£1 arc-min above 10 keV (<20 arc-sec goal)

## 7. Detector Field of View

>2.5 arc-minutes < 10 keV (>5 arc-min goal)

>8 arc-minutes > 10 keV (>12 arc-min goal)

## 8. Detector Spatial Resolution

critically sample the PSF of their optics feeds.



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## 9. Extended Source Capability

- While maintaining spatial & spectral resolution

## 10. Bright Source Capability

- Point Source: 40,000 (TBR) counts per second between 0.25 and 10 keV (**>40K may incur some loss of spectral resolution**)
- Extended Source: to 40,000 (TBR) counts per second between 0.25 and 10 keV
- Rates for 10 – 40 keV not yet established



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## 11. Timing Accuracy

- **Mission Level:** Absolute arrival times measured to an accuracy of  $\pm 100$  microsec (goal  $\pm 50$ )
- **S/C Level:** Relative arrival times measured to an accuracy of  $\pm 10$  microsec (goal  $\pm 1$ )

## 12. Celestial Coordinate Accuracy

- **Post-facto:** 5 arc-sec, 3-sigma (goal 1.5 arc-sec)

## 13. Observation Duration

- 0.5 to 48 hours





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## **14. Repointing**

- Slew and settle < 1 hour (TBR)

## **15. Solar System Objects**

- Shall be capable of observing

## **16. Sky Coverage**

- 90% of the sky for 2 weeks, twice per year
- 100% of the sky for one week, once per year

## **17. Real Time Observing**

- None



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## **18. Targets of Opportunity**

- **Within 24 hours (goal 12 hours)**

## **19. Data Rate**

- **TBD**

## **20. Data Latency**

- **2 weeks (goal 72 hours); excludes bright source and precision timing**

## **21. Overall Viewing Efficiency**

- **90%**



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## **22. Mission Lifetime**

- 4 years, consumables 6 years (goal 10 years)

## **23. Reliability**

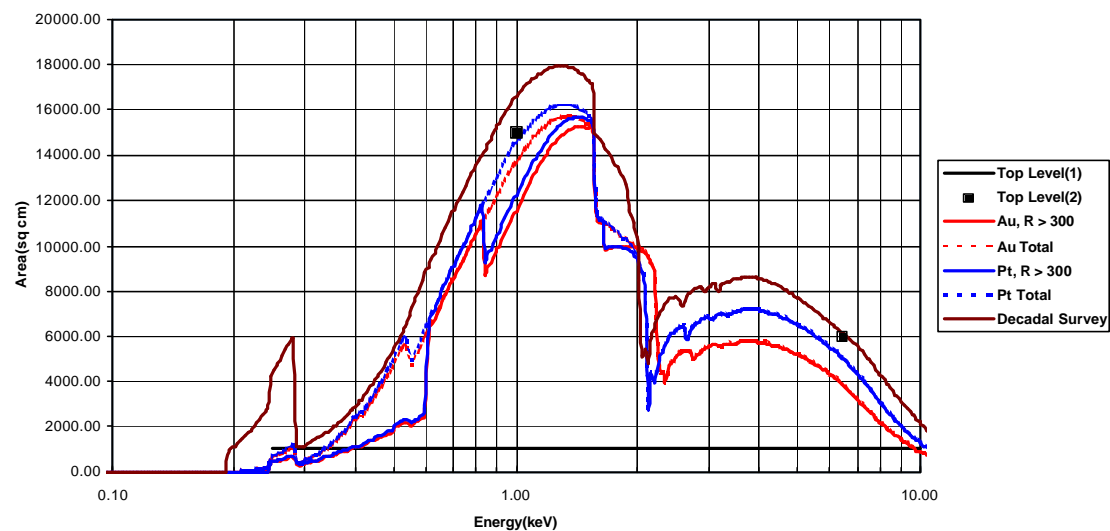
- No single failure results in >25% loss of science

## **24. Redundancy**

- Probability of success of the total mission including LVs shall be 75% for the mission life.

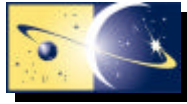


# SXT Areas I



Constellation-X FST 6/19/00

SEU



## **SXT Areas II**

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- **Define Baseline and Control Configuration**
- **Baseline vs. Decadal Survey and Top Level**
  - Lower area in baseline due to baseline mirror design, filters and coatings
  - Peak area at higher energy than top level (1keV)
- **Working design details within SXT team**
- **Expect to have more optimal design**



## **Timing Flowdown**

<b>Error Term</b>	<b>Maximum Error(ms)</b>
<b>Time signal distribution to instruments.</b>	<b>1</b>
<b>Instrument time tag error</b>	<b>5</b>
<b>Error in calibration of on-board time to ground time</b>	<b>5</b>
<b>Error in estimate of propagation time</b>	<b>1</b>
<b>Ground system error in time-tagging each real-time telemetry frame</b>	<b>10</b>
<b>Residual error in clock correlation fitting</b>	<b>5</b>
<b>Error in arrival time correction due to errors in definitive ephemeris</b>	<b>23</b>
<b>Budget (conservative, simple summed)</b>	<b>50</b>



## Timing Issues

- **Current Baseline has no timing requirement, hence 100msec timing**
  - Addition of USO, two-way ranging system and accurate ephemeris correction may allow 50 $\mu$  sec single event timing, corrected to common position at the mission level.
  - Must work orbit determination issues to allow photon arrival time to be corrected to common position for all satellites



## **Open Issues**

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### **Timing Requirement:**

- How stringently do we have to maintain spectral resolution for fast timing observations

### **Area Requirement:**

- Need an effective area requirement at  $\sim 0.25$  keV.

### **Other:**

- Overlap of HXT/SXT?